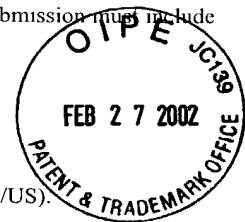
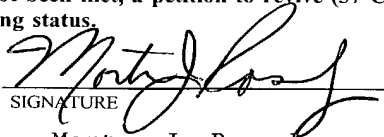



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FORM PTO-1390 (REV. 12-2001)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER MR2685-110
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <b>10/069617</b>
INTERNATIONAL APPLICATION NO. PCT/KR00/01205	INTERNATIONAL FILING DATE 24 October 2000	PRIORITY DATE CLAIMED 6 September 2000	
TITLE OF INVENTION METHOD FOR PREPARATION OF CLAY-DISPERSED POLYMER NANOCOMPOSITE			
APPLICANT(S) FOR DO/EO/US Moon Bae Ko, et al.			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<p>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</p> <p>4. <input type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p>a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</p> <p>b. <input type="checkbox"/> has been communicated by the International Bureau.</p> <p>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).</p> <p>a. <input checked="" type="checkbox"/> is attached hereto.</p> <p>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</p> <p>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</p> <p>b. <input type="checkbox"/> have been communicated by the International Bureau.</p> <p>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p>d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))</p> <p>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p> <p><b>Items 11 to 20 below concern document(s) or information included:</b></p> <p>11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included</p> <p>13. <input type="checkbox"/> A <b>FIRST</b> preliminary amendment.</p> <p>14. <input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment</p> <p>15. <input type="checkbox"/> A substitute specification.</p> <p>16. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</p> <p>18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</p> <p>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4)</p> <p>20. <input type="checkbox"/> Other items or information:</p>			



U.S. APPLICATION NO. <b>10/067617</b> INTERNATIONAL APPLICATION NO. <b>PCT/KR00/01205</b>		ATTORNEY'S DOCKET NUMBER <b>MR2685-110</b>			
21. <input checked="" type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):</b> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO . . . . . <b>\$1040.00</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO . . . . . <b>\$890.00</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO . . . . . <b>\$740.00</b>  International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) . . . . . <b>\$710.00</b>  International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) . . . . . <b>\$100.00</b> <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>		<b>CALCULATIONS PTO USE ONLY</b>          <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><b>\$ 1,040.00</b></td> <td style="width: 50%;"></td> </tr> </table>		<b>\$ 1,040.00</b>	
<b>\$ 1,040.00</b>					
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">\$</td> <td style="width: 50%;"></td> </tr> </table>		\$	
\$					
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	10 - 20 =	0	x <b>\$18.00</b>		
Independent claims	1 - 3 =	0	x <b>\$84.00</b>		
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ <b>\$280.00</b>		
<b>TOTAL OF ABOVE CALCULATIONS =</b>		<b>\$ 1,040.00</b>			
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.		\$ 520.00 +			
<b>SUBTOTAL =</b>		<b>\$ 520.00</b>			
Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).		\$ -			
<b>TOTAL NATIONAL FEE =</b>		<b>\$ 520.00</b>			
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property +		\$ 40.00			
<b>TOTAL FEES ENCLOSED =</b>		<b>\$ 560.00</b>			
		<b>Amount to be refunded:</b>	\$		
		<b>charged:</b>	\$		
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>560.00</u> to cover the above fees is enclosed.  b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.  c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>18-2011</u> . A duplicate copy of this sheet is enclosed.  d. <input type="checkbox"/> Fees are to be charged to a credit card. <b>WARNING:</b> Information on this form may become public. <b>Credit card</b> <b>information should not be included on this form.</b> Provide credit card information and authorization on PTO-2038.					
<b>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.</b>					
SEND ALL CORRESPONDENCE TO Rosenberg, Klein & Lee 3458 Ellicott Center Drive Ellicott City, Maryland 21043		<div style="text-align: center;">           SIGNATURE          Morton J. Rosenberg          NAME       </div> <div style="text-align: center;">         Reg. No. 26,049          REGISTRATION NUMBER       </div>			
 <b>04586</b> PATENT TRADEMARK OFFICE					

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METHOD FOR PREPARATION OF CLAY-DISPERSED POLYMER  
NANOCOMPOSITE

5           TECHNICAL FIELD

The present invention relates, in general, to a method for the preparation of a clay-dispersed polymer nanocomposite and, more particularly, to the use of an oxygen atom-carrying polymer with thermodynamical compatibility with a binder resin in preparing a clay-dispersed polymer nanocomposite, thus delaminating clay completely to silicate lamellas.

PRIOR ART

15           With the aim of overcoming limited physical properties of general-purpose plastics, the techniques for preparing clay-dispersed organic/inorganic composites are characterized in that clay ores of silicate layered structures are delaminated into silicate layers at nano levels and the silicate layers are dispersed in polymer resins, thereby upgrading general-purpose plastics to engineering plastics. Silicate layer, a structural unit of clay, is however difficult to disperse in polymer resins owing to its strong van der Waals attraction. To circumvent this problem, intercalants are suggested. According to a compounding technique, for example, an intercalant with a low molecular weight is introduced into the silicate layered structure to aid the penetration of polymer

resins into the structure, thereby delaminating clay ores and dispersing the silicate layers in the resins.

However, the conventional compounding technique has such a problem that, when nanocomposites are prepared from some resins, including poly(styrene-co-acrylonitrile)copolymer resins, poly(acrylonitrile-co-butadiene-co-styrene) copolymer resins, and poly(vinylchloride) resins, it is virtually impossible to completely delaminate clay ores to the extent of a silicate layer, which is a structural unit of clay. In the nanocomposites of such resins, prepared by the conventional compounding technique, in fact, there are observed blocks of nano scales, which result from the aggregation of several to tens silicate lamellas [see, *Korea Polymer Journal*, 7, 310 (1999); *ibid*, 8, 95 (2000); *ibid*, 8, 120 (2000)]. The reason is that a nitrogen and a chlorine atom, which are contained in the repeating unit acrylonitrile of poly(styrene-co-acrylonitrile) or poly(acrylonitrile-co-butadiene-co-styrene) copolymer resins and the repeating unit vinyl chloride of poly(vinylchloride) resin, respectively, is smaller in electronegativity than is an oxygen atom, which is present within organophilic clay, so that it is not easy for the polymer chain to penetrate between silicate layers.

DISCLOSURE OF THE INVENTION

Leading to the present invention, the intensive and thorough research on the preparation of clay-dispersed polymer nanocomposites, conducted by the present inventors, resulted in the finding that a polymer carrying oxygen atoms can itself penetrate into silicate structures and, when constituting a matrix for the composites, along with other polymers, help penetrate the binder resins into layered structure of silicates if they are thermodynamically compatible with the oxygen-carrying polymer.

Therefore, it is an object of the present invention to overcome the above problems encountered in prior arts and to provide a method for the preparation of clay-dispersed polymer nanocomposites, in which clay ores are completely delaminated to a silicate layer, which is a constituent minimum unit.

Based on the present invention, the object could be accomplished by a provision of a method for preparing a clay-dispersed polymer nanocomposite, which comprises introducing an oxygen-carrying polymer, alone or in combination with a thermodynamically compatible resin, as a matrix resin.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1a shows X-ray diffraction spectra of the nanocomposites of the present invention according to mixing periods of time.

Fig. 1b shows an X-ray spectrum of the clay-dispersed poly(styrene-co-acrylonitrile)copolymer nanocomposite according to the present invention, along with that of the clay-dispersed poly( $\epsilon$ -caprolactone) nanocomposite.

Fig. 2 shows X-ray diffraction spectra of the nanocomposites prepared at various temperatures according to the method of the present invention.

#### BEST MODES FOR CARRYING OUT THE INVENTION

The present invention pertains to a compounding technique of preparing a clay-dispersed polymer nanocomposite, in which a matrix resin, including a poly(styrene-co-acrylonitrile)copolymer, poly(acrylonitrile-co-butadiene-co-styrene) copolymer or poly(vinylchloride), is inserted into silicate structures with the aid of an intercalant, characterized in that a poly( $\epsilon$ -caprolactone) polymer is used.

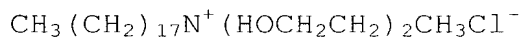
Poly( $\epsilon$ -caprolactone) carries oxygen atoms within the repeating units of its backbone, as well as being thermodynamically compatible with poly(styrene-co-acrylonitrile) copolymer, poly(acrylonitrile-co-butadiene-co-styrene) copolymer and poly(vinylchloride).

Useful in the present invention is a poly( $\epsilon$ -caprolactone) resin ranging, in molecular weight, from 10,000 to 100,000.

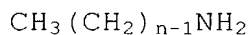
It is preferable that poly( $\epsilon$ -caprolactone) is used at an amount of 20-40 % by weight based on the total weight of the nanocomposite. For instance, if poly( $\epsilon$ -caprolactone) is added at an amount less than 20 % by weight, its compatibilization effect is too weak to bring about complete delamination into clay. On the other hand, more than 40 % by weight of poly( $\epsilon$ -caprolactone) may shield the expression of characteristic physical properties of other matrix resins.

In the present invention, clay to be dispersed in the matrix is treated with an intercalant in order to increase the dispersity of clay. The intercalant is preferably selected from the group consisting of hydroxyethylmethyloctadecylammonium chloride, which is represented by the following chemical formula 1; amines such as octyl amine, decyl amine, dodecyl amine, hexadecyl amine, and octadecyl amine, which are represented by the following chemical formula 2; and secondary amines represented by the following chemical formula 3:

Chemical Formula 1



Chemical Formula 2



wherein n is 8, 10, 12, 16 or 18.





An organophilic clay, such as that manufactured from Southern Clay Products Inc. U.S.A., identified as Closite 30A, was dry-blended at an amount of 5 % by weight with poly( $\epsilon$ -caprolactone) with a molecular weight of 80,000 at 100 °C at 120 rpm in a Minimax molder for various periods of time to obtain nanocomposites.

With reference to Fig. 1a, there are shown X-ray diffraction spectra of nanocomposites according to mixing periods of time. As seen in the spectra, the X-ray diffraction peak at around 2.5° disappears from the spectrum of the nanocomposite obtained when the mixing was continued for 20 min or longer; thus the silicate was completely delaminated with the aid of the intercalant in the nanocomposite.

## EXAMPLE 2

### Preparation of Clay-Dispersed Poly(styrene-co-acrylonitrile)copolymer Nanocomposite Using Clay-Dispersed Poly( $\epsilon$ -caprolactone) Nanocomposite

The clay-dispersed poly( $\epsilon$ -caprolactone) nanocomposite prepared in Example 1 was mixed at a weight ratio of 2:3 with a poly(styrene-co-acrylonitrile)copolymer resin, after which blending of the mixture was carried out at 100 °C for 5 min in a Minimax molder at 120 rpm to afford a clay-dispersed poly(styrene-co-acrylonitrile)copolymer nanocomposite.

With reference to Fig. 1b, an X-ray spectrum of this clay-dispersed poly(styrene-co-acrylonitrile)copolymer nanocomposite is shown, along with that of the clay-dispersed poly( $\epsilon$ -caprolactone) nanocomposite. In the X-ray spectrum of the nanocomposite of interest, an X-ray diffraction peak is detected at around  $2.5^\circ$ , but its intensity is very weak, indicating that organophilic clay is significantly dispersed.

10

### EXAMPLE 3

Preparation of Clay-Dispersed Poly( $\epsilon$ -caprolactone) Nanocomposite Through Twin-Screw Extruder and Preparation of Poly(acrylonitrile-co-butadiene-co-styrene) Copolymer Nanocomposite Using Master Batch Comprising the Same

15

An organophilic clay, such as that manufactured by Southern Clay Products Inc., U.S.A., identified as Closite 30A, was dry-blended at an amount of 10 % by weight with poly( $\epsilon$ -caprolactone) with a molecular weight of 80,000 and the blend was extruded through a twin-screw extruder at  $100^\circ\text{C}$  at 250 rpm to give a nanocomposite in which the silicate of the organophilic clay was completely delaminated to silicate layers. After being pelletized, the clay-dispersed poly( $\epsilon$ -caprolactone) nanocomposite was blended at a weight ratio of 1:2 with a poly(acrylonitrile-co-butadiene-co-styrene) copolymer, followed by extruding the blend

20

25

through a twin-screw extruder to produce a clay-dispersed poly(acrylonitrile-co-butadiene-co-styrene) copolymer nanocomposite.

#### EXAMPLE 4

5           One Pot-Type Preparation of Clay-Dispersed  
Poly(styrene-co-acrylonitrile) Nanocomposite Through  
Twin-Screw Extruder

With a matrix in which a poly( $\epsilon$ -caprolactone) with a molecular weight of 10,000 was contained at an  
10 amount of 30 % by weight with the remaining portion being a poly(styrene-co-acrylonitrile) copolymer, Closite 30A, an organophilic clay commercially available from Southern Clay Products Inc., U.S.A., was dry-blended at an amount of 5 % by weight. At various  
15 temperatures (220, 200, 180, 160 and 140 °C), the resulting blend was extruded through a twin-screw extruder at 250 rpm to produce nanocomposites.

Fig. 2 shows X-ray diffraction spectra of the nanocomposites prepared at various temperatures. As  
20 apparent from these spectra data, the clay-dispersed organic/inorganic nanocomposite is made of completely delaminated silicate layers, which are constituent minimum units, when being extruded at 140 °C, but contained clay nanoblocks when being extruded at 220  
25 °C.

## EXAMPLE 5

Preparation of organophilic clay from Octadecylamine  
and Preparation of Clay-Dispersed Poly(styrene-co-  
acrylonitrile)copolymer Nanocomposite Using the Same

5           In a 3,000 ml beaker were charged 1,500 ml of  
deionized water, 8.1 g of octadecylamine and 3.0 ml of  
hydrochloric acid and the solution was heated to 80 °C  
with stirring (Solution A). 1,500 ml of deionized  
10           water and 30 g of clay, such as that manufactured by  
Kunimine Co. Japan, identified as Kunifia F, were added  
into another 3,000 ml beaker and heated to 80 °C. This  
clay dispersion was poured to the Solution A and  
stirred for 1 hour, after which a white precipitate was  
separated by filtration. After being washed with  
15           distilled water maintained at 80 °C, the precipitate  
was dried to give 32.1 g of organophilic clay. This  
was ball-milled to obtain a powder (C18-MONT) with a  
size of 50  $\mu\text{m}$ . Based on data of X-ray diffraction  
tests, the space between silicate lamellas was  
20           calculated to be 19 Å. The nanocomposite was measured  
to comprise 74.0 % by weight of the content of pure  
clay as measured by thermo gravimetric analysis. Taken  
together, the X-ray diffraction data and the thermo  
gravimetric analysis data demonstrate that the clay has  
25           been transformed to organophilic clay.

To a polymer matrix in which poly( $\epsilon$ -caprolactone)  
with a molecular weight of 10,000 was blended at an  
amount of 30 % by weight with a poly(styrene-co-

acrylonitrile)copolymer, the above organophilic clay (C18-MONT) was added at an amount of 5 % by weight and dry-blended. The resulting blend was extruded at 160 °C at 250 rpm to give a clay-dispersed poly(styrene-co-acrylonitrile)copolymer nanocomposite in which the silicate of the organophilic clay was completely delaminated to silicate layers.

#### EXAMPLE 6

One Pot-Type Preparation of Clay-Dispersed Poly(acrylonitrile-co-butadiene-co-styrene) Copolymer Nanocomposite Using Twin-Screw Extruder

To a polymer matrix in which poly( $\epsilon$ -caprolactone) with a molecular weight of 10,000 was blended at an amount of 30 % by weight with a poly(acrylonitrile-co-butadiene-co-styrene) copolymer, organophilic clay, such as that manufactured by Southern Clay Products Inc. U.S.A., identified as Closite® 30A, was added at an amount of 5 % by weight and dry-blended. The resulting blend was extruded at 160 °C at 250 rpm to give a clay-dispersed poly(acrylonitrile-co-butadiene-co-styrene) copolymer nanocomposite in which the silicate of the organophilic clay was completely delaminated to silicate layers.

EXAMPLE 7

One Pot-Type Preparation of Clay-Dispersed  
Poly(vinylchloride) Copolymer Nanocomposite Using  
Single-Screw Extruder

5           To a polymer matrix in which poly( $\epsilon$ -caprolactone)  
with a molecular weight of 10,000 was blended at an  
amount of 30 % by weight with a poly(vinylchloride)  
polymer, organophilic clay, such as that manufactured  
by Southern Clay Products Inc. U.S.A., identified as  
10   Closite 30A, was added at an amount of 5 % by weight  
and dry-blended. The resulting blend was extruded at  
160 °C at 250 rpm through a single-screw extruder to  
give a clay-dispersed poly(vinylchloride) polymer  
nanocomposite in which the silicate of the organophilic  
15   clay was completely delaminated to silicate layers.

INDUSTRIAL APPLICABILITY

Over the used polymers themselves, the clay-  
dispersed polymer nanocomposites according to the  
present invention were measured to be improved by 30-  
20   50% in elastic modulus, by 5-10% in mechanical  
properties, and by 50 °C in heat deflection  
temperature. With these advantages, the nanocomposites  
according to the present invention can replace  
conventional ABS resin and various PVC resins for use  
25   in housing electronic appliances.

The present invention has been described in an  
illustrative manner, and it is to be understood that

the terminology used is intended to be in the nature of description rather than of limitation. Many modifications and variations of the present invention are possible in light of the above teachings. 5 Therefore, it is to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.







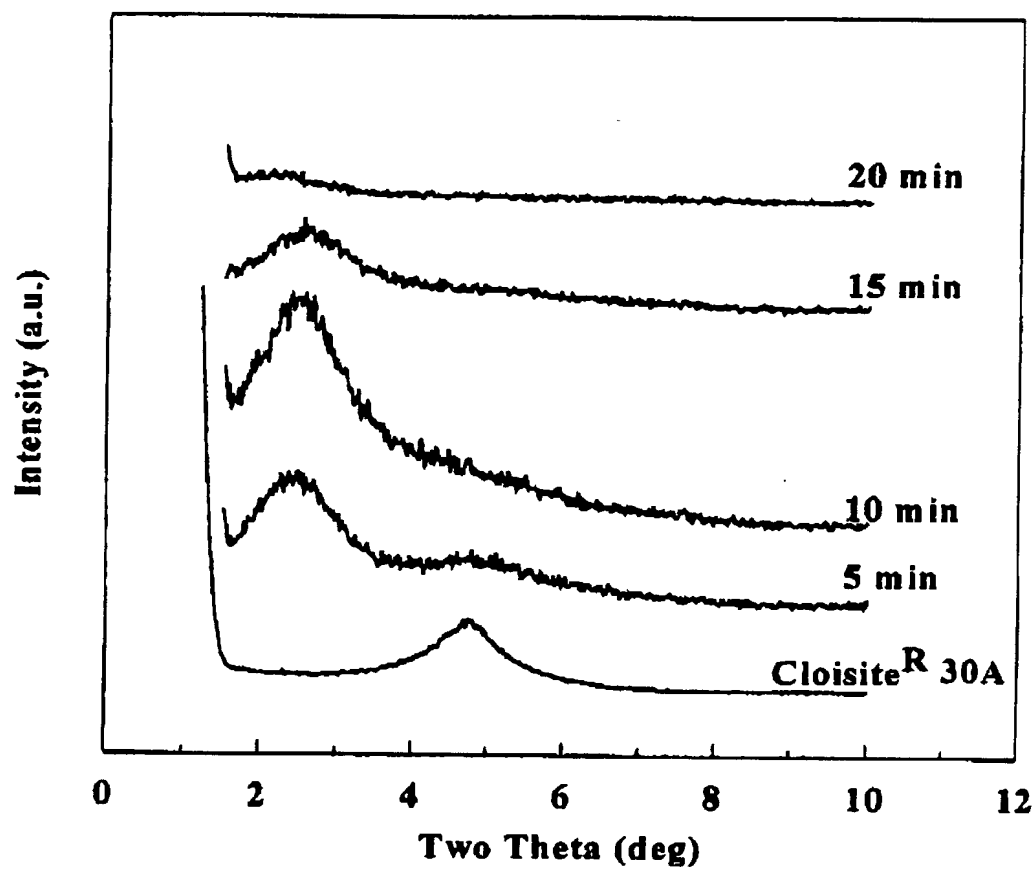
9. The method as set forth in claim 1, wherein the clay-dispersed polymer composite comprises clay which contains montmorillonite.

10. The method as set forth in claim 1, wherein  
5 the poly( $\epsilon$ -caprolactone) is used at an amount of 20-  
40 % by weight based on the total weight of the  
nanocomposite.

Disclosed is a method for preparing a clay-dispersed polymer nanocomposite. In this method, a polymer, which carries oxygen atoms within the repeating units of its backbone and is thermodynamically compatible with a binder resin, is used as a matrix resin. Useful is poly( $\epsilon$ -caprolactone) owing to its thermodynamic compatibility with poly(styrene-co-acrylonitrile) copolymers, poly(acrylonitrile-co-butadiene-co-styrene) copolymers, and poly(vinylchloride) resins. Poly( $\epsilon$ -caprolactone) resins aid the binder resins to penetrate into silicate layers so that the silicate of the organophilic clay was completely delaminated to silicate lamellas.

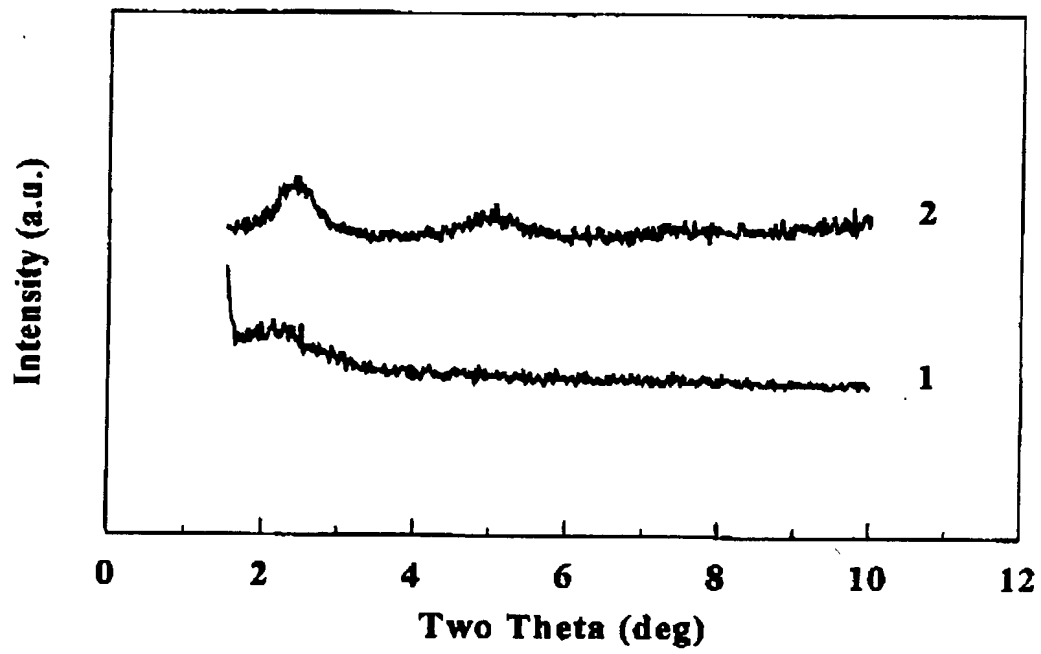
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FIG. 1a



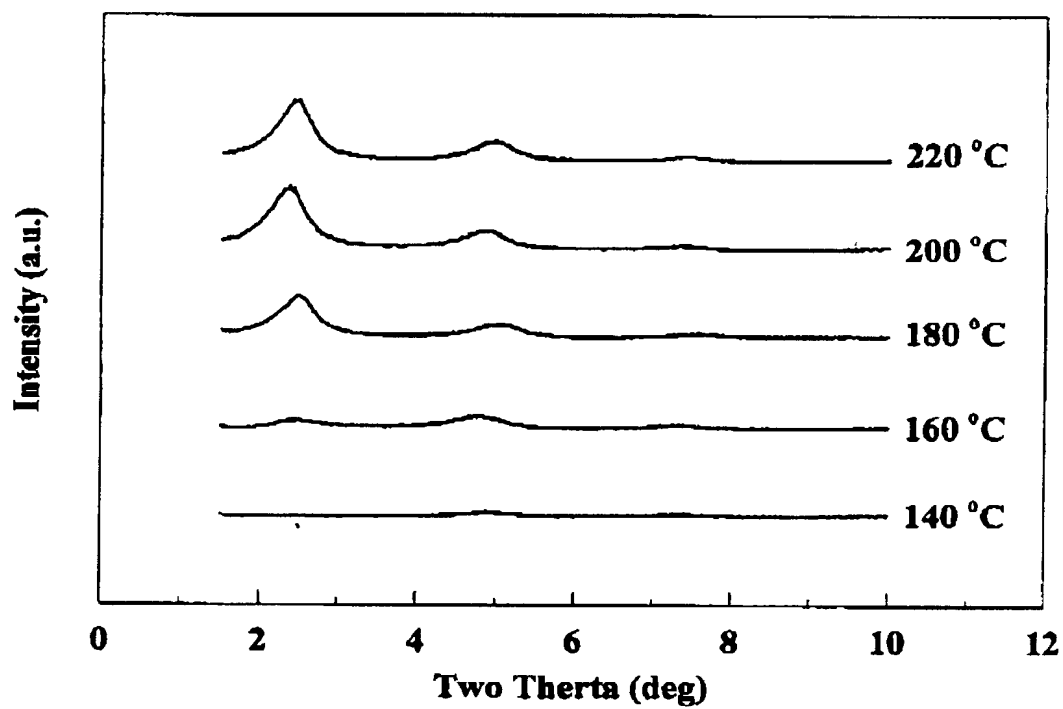
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FIG. 1b



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FIG. 2



# DECLARATION FOR PATENT APPLICATION

Docket Number (Optional)  
MR2685-110

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled  
METHOD FOR PREPARATION OF CLAY-DISPERSED POLYMER NANOCOMPOSITE, the specification of which is attached hereto unless the following box is checked:

☐ was filed on \_\_\_\_\_ as United States Application Number or PCT International Application Number \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

<u>2000-52689</u> (Number)	<u>KR</u> (Country)	<u>6 September 2000</u> (Day/Month/Year Filed)	<input type="checkbox"/>
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/>

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

(Application Number) \_\_\_\_\_ (Filing Date) \_\_\_\_\_

(Application Number) \_\_\_\_\_ (Filing Date) \_\_\_\_\_

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

<u>PCT/KR00/01205</u> (Application Number)	<u>24 October 2000</u> (Filing Date)	<u>Pending</u> (Status-patented, pending, abandoned)
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(Application Number) \_\_\_\_\_ (Filing Date) \_\_\_\_\_ (Status-patented, pending, abandoned) \_\_\_\_\_

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Address all telephone calls to  
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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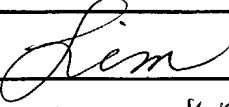
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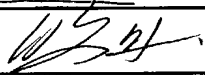
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